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A METHOD OF PRODUCING A LIQUID CRYSTAL DISPLAY PANEL

[Abstract]

PROBLEM TO BE SOLVED: To provide a manufacturing method for a liquid crystal display panel which can improve display quality by preventing a liquid crystal panel display part from having display unevenness.

SOLUTION: By the manufacturing method for the liquid crystal display panel constituted by dripping and charging liquid crystal between the internal surfaces of a couple of glass substrates having their periphery surrounded with a seal material, a first substrate 1 where a transparent conductive film 3, an inorganic insulating film 5, and an organic alignment layers 7 are formed in order and a second glass

substrate 2 which has an organic alignment layer 8 formed directly on a transparent conductive film 4 are prepared and after the liquid crystal 11 is dripped on the second glass substrate 2, the second glass substrate 2 and first glass substrate 1 are laminated together.

[Claim(s)]

[Claim 1] A method of producing a liquid crystal panel which drops and fills a liquid crystal on inside of a pair of glass substrates that is surrounded by seal materials, wherein the method comprises the processes of:

preparing a first glass substrate in which a transparent conductive layer, a inorganic insulating layer, and organic alignment layer are generated in turn, and a second glass substrate in which said organic alignment layer is generated directly on the transparent conductive layer;

dropping said liquid crystal on said second glass substrate; and

bonding said second glass substrate with said first glass substrate.

[Title of the Invention]

A METHOD OF PRODUCING A LIQUID CRYSTAL DISPLAY PANEL

[Detailed Description of the Invention]

[Field of the Invention]

This invention relates to a method of producing a liquid crystal panel, and more particularly, a method of producing a liquid crystal panel that is capable of avoiding display stains due to liquid crystal drop on a liquid crystal display portion.

[Description of the Prior Art]

Typically, Liquid Crystal Display (referred to LCD hereafter) displays an image by converting a specific initial molecular arrangement of liquid crystal molecular to another molecular arrangement due to an effect of applying an electric field, etc and by using a change of an optical property of the liquid crystal cell that results from this molecular arrangement. Because LCD are preferably thin layer and light-weighted, and operates in lower voltage and lower power, as opposed to any other display device, it is used in various fields from OA that is representative of PC up to consumer electronics, industrial machine, etc,. Particularly, in LCD market of OA field, there is a need for uniform display without display stains of image in accordance with higher accuracy, higher capacity, and higher screen size.

Presently, in LCD market, there are simple matrix STN (Super Twisted Nematic) LCD and active matrix TFT (Thin Film Transistor) LCD. For example, STN LCD uses birefringence and rotatory polarization of light such that a liquid crystal molecular is pre-tilted at 3 degrees to 8 degrees and an arrangement direction of liquid crystal molecular between two substrates is twisted 180 degree to 270 degree, thereby to achieve the very sharp threshold characteristics, but it is important to disorder the molecular arrangement so that it achieves an uniform display without stains.

Conventionally, as a method of producing the liquid crystal display panel, there are generally proposed two methods as follows: One method is that glass substrate having oppositely disposed electrodes are bonded by seal materials having an opening prepared partially to surround a display cell area, it makes an empty panel of cell structure, and the liquid crystal is filled from the opening by a vacuum injection method using capillary and pressure difference. The other is a drop method of liquid crystal that can substantially reduce the amount of the time necessary to fill the liquid crystal in above vacuum injection method, for example a method such as disclosed in Japanese Patent Laid-Open No. 1987-89025, which will be described now with reference to figures.

Figure 2 is a diagram that illustrates processes according to the method of

producing prior art liquid crystal display panel, which are disclosed in above-mentioned Publication.

The method of producing the liquid crystal display panel according to the drop method of liquid crystal, generates an inorganic insulting layer 5 and an organic alignment layer 7 on a transparent conductive 3 in glass substrate 1 while arranging spacer 9 for marinating a gap, and generates an inorganic insulting layer 6 and an organic alignment layer 8 on transparent conductive 4 in glass substrate 2 while generating seal materials 10 that surround a display cell area and dropping the predetermined amounts of liquid crystal 11 on the portion surrounded by the seal materials, with respect to substrates 1, 2 having conductive layers oppositely disposed as shown in figure 2(a). Thereafter, the invention provides the liquid crystal display panel by bonding the substrates under the reduced pressure. Figure 2(b) shows a cross-sectional view after bonding substrates 1, 2, and Figure 2(c) shows the top plane view of the same.

[Problem(s) to be Solved by the Invention]

However, according to the method, since the inorganic insulating layers 5, 6 have been arranged on the transparent 3, 4 in the upper and lower glass substrate 1, 2 in order to prevent a short between the upper and lower glass substrates 1, 2 in the liquid crystal display panel, it is likely that liquid crystal drop-shaped stains

remain due to an electric charge of a dielectric polarization that may occur in an organic alignment layer 8 where liquid crystal is dropped, and display quality of liquid crystal panel is lowered, or display stains 12 occur as shown in Figure 2(c). To avoid these facts, it cope with a heating process after sealing the liquid crystal, but it cannot erase the liquid crystal drop-shaped stains completely, as the result that it leads to deterioration of yield.

This invention resolves the above-mentioned problems and has objects to prevent display stains in liquid crystal display portion, and provide a method of producing a liquid crystal display panel that can improve a display quality.

[Means for Solving the Problem]

A method of producing a liquid crystal panel of this invention is a method of producing a liquid crystal panel which drops and fills a liquid crystal on inside of a pair of glass substrates that is surrounded by seal materials, wherein the method comprises the processes of preparing a first glass substrate in which a transparent conductive layer, a inorganic insulating layer, and organic alignment layer are generated in turn, and a second glass substrate in which the organic alignment layer is generated directly on the transparent conductive layer; dropping the liquid crystal on the second glass substrate; and bonding that second glass substrate

with the first glass substrate.

According to this invention as described above, since it is possible to make escape ane electric charge of a dielectric polarization that may occur in the organic alignment layer 8 where liquid crystal is dropped, it allows the liquid crystal display panel to have advantages of preventing liquid crystal drop-shaped stains from occurring and improving display quality.

[Embodiment of the Invention]

The embodiment of this invention will be described now, with reference to figures. Further, like elements as prior art are denoted as like numerals.

Figure 1 is a diagram that illustrates a method of producing a liquid crystal display panel according to one embodiment of this invention.

With respect to substrates 1, 2 having conductive layers oppositely disposed as showed in Figure 1(a), the method of producing the liquid crystal display panel generates organic alignment layer 7 that consists of an inorganic insulting layer 5 and polyimide resin for arranging liquid crystal on a transparent conductive 3 in a glass substrate 1 while arranging spacer 9 for maintaining a gap, and generates an organic alignment layer 8 on a transparent conductive 4 in a glass substrate 2 while generating seal materials 10 that are surrounding display cell areas and dropping the predetermined amounts of liquid crystal 11 on the

portion surrounded by the seal materials. Thereafter the method provides the liquid crystal display panel by bonding the substrates under the reduced pressure. Figure 1(b) shows a cross-sectional view after bonding substrates 1, 2.

It is different from the prior art in that the organic alignment layer 8 is generated directly on the transparent conductive 4 but an inorganic insulating layer is not generated, with respect to the glass substrate 2 on which liquid crystal is dropped. More specifically with respect to the glass substrate 2, the transparent conductive layer 4 that is a part of panel display portion is generated by photolithography, and the organic alignment layer 8 consisting of polyimide resin is printed by flexograhpic printing thereon, cured at the predetermined temperature, and aligned by rubbing process.

On the glass substrate 2 that is achieved as described above, the predetermined amount of liquid crystal 11 is dropped. Then, it completes as shown in Figure 1(b) by bonding it to the other glass substrate 1 like the prior art.

Since only organic alignment layer 8 is generated on the transparent layer 4 without generating inorganic insulating layer and then liquid crystal is dropped as described above, it is possible to make escape the electric charge of the dielectric polarization that may occur in the organic alignment layer 8 where liquid crystal is dropped and prevent liquid crystal drop-shaped strains from occurring, thereby to

maintain stable molecular arrangement of the liquid crystal.

As it was described above, according to this embodiment, since only organic alignment layer is generated directly on the transparent layer 4 in glass substrate that will be a display portion without generating inorganic insulating layer, and then liquid crystal is dropped, it is possible to make escape the electric charge of the dielectric polarization that may occur in the organic alignment layer 8 where liquid crystal is dropped and prevent liquid crystal drop-shaped stains from occurring, with the result that it can maintain stable molecular arrangement of liquid crystal and realize the liquid crystal display panel of good display quality.

[Effect of the Invention]

According to this invention as described above, it allows the liquid crystal display panel to have advantages of preventing liquid crystal drop-shaped stains from occurring and improving display quality.

[Description of Drawings]

Fig. 1(a) and 1(b) are diagrams that illustrate processes according to a method of producing the liquid crystal display panel of one embodiment of this invention.

Fig. 2(a) to 2(d) are diagrams that illustrate processes according to prior art method of producing liquid crystal display panel.

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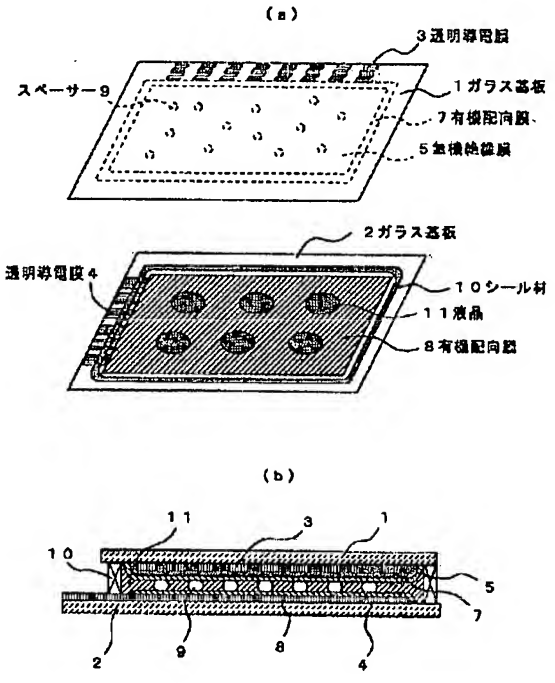
(54)【発明の名称】　液晶表示パネルの製造方法

(57)【要約】
【課題】　液晶パネル表示部における表示むらの発生等を防止し、表示品位の向上を図ることができる液晶表示パネルの製造方法を提供する。
【解決手段】　周辺をシール材で囲まれた一対のガラス基板の内面に液晶を滴下充填した液晶表示パネルの製造方法であって、透明導電膜３、無機絶縁膜５、有機配向膜７を順次成膜した第１のガラス基板１と、透明導電膜４上に有機配向膜８を直接成膜した第２のガラス基板２を準備し、第２のガラス基板２に液晶１１を滴下した後、この第２のガラス基板２と第１のガラス基板１とを貼り合わせるものである。



【特許請求の範囲】
【請求項１】　周辺をシール材で囲まれた一対のガラス基板の内面に液晶を滴下充填した液晶表示パネルの製造方法であって、透明導電膜、無機絶縁膜、有機配向膜を順次成膜した第１のガラス基板と、透明導電膜上に有機配向膜を直接成膜した第２のガラス基板を準備し、前記第２のガラス基板に液晶を滴下した後、この第２のガラス基板と前記第１のガラス基板とを貼り合わせることを特徴とする液晶表示パネルの製造方法。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は液晶表示パネルの製造方法、特に、液晶パネル表示部への液晶滴下による表示むらを防ぐことができる液晶表示パネルの製造方法に関するものである。
【０００２】
【従来の技術】液晶ディスプレイ（以下ＬＣＤという）は液晶分子の特定な初期分子配列を電場印加などの作用で他の分子配列状態に変化させ、この分子配列に伴う液晶セルの光学的性質の変化を利用して画像表示させるもので、他の表示素子に比べて薄型、軽量であり、低電圧、低電力で動作するなどの利点を兼ね備えていることから、パソコンに代表されるＯＡ分野から、家電、産業機器の分野に至るまで多岐にわたって使用されている。特に、ＯＡ分野におけるＬＣＤ市場においては、高精細化、大容量化、大画面化などにより画像表示むらのない均一な表示が求められている。
【０００３】現在、ＬＣＤ市場では、単純マトリクス方式のＳＴＮ（Ｓｕｐｅｒ　Ｔｗｉｓｔｅｄ　Ｎｅｍａｔｉｃ）形ＬＣＤと、アクティブマトリクス方式のＴＦＴ（Ｔｈｉｎ　Ｆｉｌｕｍ　Ｔｒａｎｓｉｓｔｏｒ）形ＬＣＤがある。例えば、ＳＴＮ形ＬＣＤでは、複屈折性と光の旋光性を利用したもので、液晶分子に３°～８°程度のプレチルト角を持たせ、２枚の基板間で液晶分子の配向方向を１８０°～２７０°捻ることで著しく急峻なしきい値特性を得ることを可能にしているが、むらのない均一な表示を得るためには、いかに液晶の分子配向を乱さないようにするかが重要である。
【０００４】従来、この液晶表示パネルを製造する方法としては、一般的に次のような２つの方法が提案されている。一つは、対向配置された電極を有するガラス基板を表示セル領域を囲むように一部開口部を設けたシール材で接着固定し、セル構造の空のパネルを作り、液晶を開口部より毛細管現象と圧力差を利用した真空注入法により充填させる方法である。もう一つは、上記の真空注入方法に対し、液晶を充填させるのに要する時間を大幅に短縮することができる液晶滴下組立方法、例えば、特開昭６２－８９０２５号公報に示される方法があり、以下、これについて図面を参照しながら説明する。
【０００５】図２は従来の液晶表示パネルの製造方法における製造工程の説明図であり、前記公報に開示されているものである。
【０００６】この液晶滴下組立方法による液晶表示パネルの製造方法は、図２（ａ）に示すように対向配置された導電膜を有するガラス基板１，２において、ガラス基板１の透明導電膜３上に無機絶縁膜５と有機配向膜７を成膜すると共に、ギャップ保持のためのスペーサー９を配置し、ガラス基板２の透明導電膜４上に無機絶縁膜６と有機配向膜８を成膜すると共に、表示セル領域を囲むシール材１０を形成してシール材１０で囲まれた部分に液晶１１を所定量滴下し、減圧下で貼り合わせて液晶表示パネルを得るものである。図２（ｂ）はガラス基板１，２の貼り合わせ後の断面形状を示し、図２（ｃ）は同平面形状を示している。
【０００７】
【発明が解決しようとする課題】しかしながら、このような方法では、液晶表示パネルの上下ガラス基板１，２間のショートを防止するために、上下ガラス基板１，２表面の透明導電膜３，４の上に、無機絶縁膜５，６を設けているために、液晶を滴下したところの有機配向膜８に発生する誘電分極の電荷により液晶滴下形状のむらが残りやすく、液晶表示パネルの特性低下や図２（ｃ）に示す表示むら領域１２が発生しやすいので、これを防止するために、液晶を封入後、熱処理して対処しているものの、上記液晶滴下形状のむらを完全に消すことができないものも多く、歩留まりの悪化を招くという問題点があった。
【０００８】本発明は上記従来の問題点を解決するものであり、液晶パネル表示部における表示むらの発生等を防止し、表示品位の向上を図ることができる液晶表示パネルの製造方法を提供することを目的とする。
【０００９】
【課題を解決するための手段】本発明の液晶表示パネルの製造方法は、周辺をシール材で囲まれた一対のガラス基板の内面に液晶を滴下充填した液晶表示パネルの製造方法であって、透明導電膜、無機絶縁膜、有機配向膜を順次成膜した第１のガラス基板と、透明導電膜上に有機配向膜を直接成膜した第２のガラス基板を準備し、前記第２のガラス基板に液晶を滴下した後、この第２のガラス基板と前記第１のガラス基板とを貼り合わせるものである。
【００１０】本発明によれば、有機配向膜のみの基板上に液晶を滴下をすることにより、滴下したところの有機配向膜に発生する誘電分極の電荷を容易に逃がすことができるので、液晶滴下形状のむらの発生を抑え、安定した液晶の分子配向を保つことができ、表示部における表示品位の向上を図ることができる。
【００１１】
【発明の実施の形態】以下、本発明の一実施の形態について、図面を参照しながら説明する。なお、前記従来の